point by *one* dynamo-electric machine. Endeavours to cut up the electric light into a large number of small lights, although of great interest, must, he thinks, invariably result in engineering failure, as nobody could afford to pay for the luxury received. Thus, in the opinion of so competent a judge, all methods hitherto employed for using this method of lighting in public, are failures, involving a waste of power and money, with inadequate result. Having satisfied himself of the difficulty and impracticability of the division of the electric light, Mr. Schwendler tried diffusion, *i.e.*, a few large lights (each light produced by one machine) are placed at different points of the space, and by optical means the light is diffused over a large area. This method he finds perfectly practicable. There is naturally a large amount of light lost (by absorption), but, he states, this loss will bear a constant ratio to the total light produced, nay probably may decrease with the intensity. The actual plan by which Mr. Schwendler proposes to do it, and has done it during the trial, is to construct a silvered glass reflector in which a powerful electric light burns, throwing direct and reflected rays up to a white ceiling or any other convenient white surface. A number of such arrangements is to be put up in the most convenient places, and where they have the greatest effect. The form and size of each reflector will depend on the locality where it is to be used.

Any repairs required in course of time Mr. Schwendler believes can easily be effected by an ordinary mechanic. Only one man, he states, is actually required in each station, to take charge of the steam engine, dynamo-electric machine, lamps, and reflectors. Mr. Schwendler appends to this *précis* several details with reference to the adaptation of electric lighting to Indian stations, and also on some of the scientific results obtained by his experiments. Altogether his report is likely to be the most important contribution to a thorough knowledge of the public utilisation of electric lighting that has been made since the question has been resuscitated during the last year or two; and we should advise all interested in the subject to wait for his report before taking decisive steps to the adoption of any particular system.

NOTES

THE Emperor of Germany has approved of the election of Mr. Darwin and Prof. Owen as Foreign Members of the Berlin Academy of Sciences.

WE are glad to learn that M. Raoul Pictet is quite restored to health. The University of Geneva has conferred upon him the honorary degree of Doctor, and he has just been made a Chevalier of the Legion of Honour by the French Government, in recognition of his eminent services to science, and especially of his successful experiments in the liquefaction of gases.

A COMPETITIVE examination is going on at the Paris Conservatoire des Arts et Métiers, for the appointment of a professor of physics and meteorology at the National School of Agriculture. The examination has been conducted on a new principle by a jury presided over by M. Boussingault. Each of the seven candidates has expounded before the jury his programme of lectures to be delivered, and each of them has in turn delivered a lecture on physics, and another on meteorology, after a preparation of four hours. The competition is open to all without any condition of age, qualifications, and nationality; but the jurymen are instructed to attend, in giving their verdict, to the degrees obtained by candidates and their previous work or discoveries.

THE Municipal Council of Paris has voted a subvention of 2,000 francs to M. Joseph Vinot, editor of the *Ciel*, for a series of popular lectures on astronomy, to be delivered at the Salle des Ecoles, rue d'Arras. Admiral Mouchez, who was present at the last lesson, announced to the pupils, numbering from 400 to 500, that he will take measures to admit them to the observatory *seriatim*, in order to initiate them into the use of the large astronomical instruments so ably described by their professor. In one of the last reports read before the Paris Municipal Council it was stated that it would be necessary to establish somewhere in Paris an observatory of popular astronomy entirely devoted to the public exhibition of celestial phenomena, other establishments being entirely devoted to investigation.

PROF. S. P. THOMPSON has reprinted his valuable address on "Technical Education," given at the Social Science Congress last October. In this time of intense depression, when trade seems to be drifting from our shores, and people are wondering how it is that other nations are outstripping us in departments that used to be considered as peculiarly British, Prof. Thompson's remarks on the ignorance of our mechanics are peculiarly appropriate. One telling instance he gives of the lamentable want of intelligent skill that prevails among workmen and manufacturers in this country:—"I was recently informed by Prof. Graham Bell that he is about to return to America to resume his researches in telephony, his principal reason for quitting his native shores once more being that he found himself, in this country, unable to get his ideas carried out, unable to procure workmen capable of comprehending and carrying out new ideas, such workmen, in fact, as he was able to employ during his four years' residence in America. He pointed to the laboratory of Mr. Edison as an example of an institution to which there is no parallel in this country, though there are several in the States, a laboratory equipped with a staff of trained workmen, Americans, Germans, or Englishmen, whose business is not to work on old lines, but to carry out and put into practical form new and untried devices. No wonder inventions multiply when inventors have so powerful an aid as this to further their designs; and, mark this, Mr. Bell returns to set up a similar laboratory because he cannot find in his native country men whose technical training would qualify them for his particular work." In a note Mr. Thompson gives the following paragraph from a letter of Prof. Graham Bell to a friend in America which has been going the round of the American press:—"If you want to know why inventors are more numerous in America than they are here, come and live for six months in England. If you wish to know how it feels to be brimfull of ideas, and yet to be unable to have one of them executed, come to England. If you wish to know how it feels to have to wait for a month to have the simplest thing made, and then be charged a man's wages for two months, come to England. You will here be unable to see the interior of a workshop or to come into direct contact with your workmen, and the people seem incapable of working except in the ruts worn by their predecessors. They are absolutely incapable of calculating any new design without the most laborious oversight from the inventor, and their masters, instead of encouraging invention, do all they can to put a stop to it by refusing admission to the workshops and charging the most exorbitant prices for experimental work, avowedly because 'they don't want such kind of work,' 'it gives more trouble than it is worth;' and 'if you must have new things made you must expect to pay for them!' It is in vain that I say I am willing to pay anything to have my work done, and that what I object to is having to pay for not having it done. It is the same everywhere. Not only is your work not done, but you have to wait so long for the simplest things that your ideas cool, and you get quite exasperated at your inability to do anything." The moral of all this is obvious.

THE widow of the late Prof. E. Eichwald has presented the remarkable palæontological collections of her husband to the St. Petersburg University, which already possessed a part of them. These collections, collected by the late Prof. Eichwald since 1825, number no less than 30,000 specimens of fossils from the various formations of Western Europe, from the Petchora Land, from the Aleutian Islands, Siberia, Crimea, &c.; several European geologists as well as the late Mr. Peabody, have many times negotiated for the purchase of them.

On December 22, Prof. Forster, Director of the Bern Observatory, gave to the Bern Economical Society a very interesting report on weather-warnings. After a sketch of the development of these warnings during past years in Europe, he pointed out the importance of the "Service Agricole," established between France and Austria, by which daily telegrams are sent, advertising the coming weather; 85 per cent. of these prognostications having been perfectly true, 7 per cent, approximately true, and only 8 per cent. untrue. As to the introduction of such a service in Switzerland, it would meet with great difficulties because of the great variety of topographical features of the country and of the incomplete knowledge of the local climatic conditions. These last having been, however, carefully studied since 1864, the first steps towards the establishment of such a service were recently made by the Swiss Meteorological Commission, some of whom wished to undertake immediately to introduce weather warnings into Switzerland, whilst the majority of the Commission was for the adjournment of them for one or two years. The Society expressed their desire for the introduction of weather prognostics as soon as possible, and we may hope that shortly Switzerland also will have its weather warnings.

The Association Scientifique de France will commence at the Sorbonne its series of lectures for 1879. On January 16 M. Milne-Edwards, president of the Association, will be in the chair. M. de Lesseps will lecture on Central Africa. The lecture will be illustrated by dissolving views made with drawings sent by Gordon Pasha from the newly-annexed Egyptian provinces.

The *Reale Istituto Lombardo di Scienze e Lettere* has recently published a list of subjects for prizes to be awarded in this and following years. Among these subjects are the following:—Nosological geography of Italy; critical history of the telephone; on the nature of miasma and contagion; on the direction of balloons; is the generative material of hydrophobia a virulent principle or an organic germ? history of the progress of anatomy and physiology in the present century, especially with regard to the doctrine of Gall; illustration of some facts of the macro- or microscopic anatomy of the human brain; motor centres of the cerebral system; statistics of motor force, hydraulic and steam, in and around Milan.

The Borough engineer of Liverpool has issued a not very encouraging report on the result of his visit to Paris for the purpose of examining the systems of electric lighting in use there. They are much more expensive than gas in Liverpool, and more than 50 per cent. of the light is absorbed by the globes used. Nevertheless he recommends a trial in Liverpool to find if no more economical method can be discovered. We recommend to him a perusal of Mr. Schwendler's report referred to elsewhere.

We have received from Spain two numbers of a fortnightly scientific journal, published at Barcelona, which we welcome as a hopeful sign of progress in that country. The *Crónica Científica*, as the journal is called, while containing considerable extracts from foreign journals, and reports of foreign science, has a fair proportion of original contributions from Spanish investigators.

We have received the number of the *Anales* of the Argentine Scientific Society for November. Among the papers is the continuation of M. Carlos Berg's monograph on the *Hemiptera argentina*, and a paper by Dr. D. Tomás Peron on the bark of Quebracho Blanco (*Aspidosperma quebracho*). Among the honorary members of this Society we notice the name of "Dr. Carlos Darwin;" while "Juan Lubbok, Londres," is a corresponding member.

In connection with the Yorkshire Naturalists' Union, a "Grand Exhibition" of natural history specimens and scientific apparatus will be held from January 10 to 16 at the Mechanics' Institute, Leeds. On January 10 the Exhibition will be opened by the President of the Union, Mr. H. C. Sorby, F.R.S. The exhibition will be opened every succeeding day from 10 A.M. to 10 P.M., and will include in the various departments of natural history a large number of objects, including some of the finest private collections in the county, whilst the Physical Science Department will contain all the latest scientific novelties, including the apparatus for the liquefaction of oxygen, &c. There will also be a quantity of apparatus seldom exhibited to the public, together with instruments used in important original researches. Every evening a series of demonstrations and short addresses, and selections of music will be given. Microscopes and aquaria will be constantly on view. In the basement will be shown the process of manufacture of scientific apparatus. Although the announcement of this exhibition smacks a little too much of Barnum and the penny show, still the exhibition and lectures seem likely to be productive of permanent good in the district.

The International Piscicultural Exhibition which will take place at Berlin in the spring of next year promises to be extremely interesting. A number of English, Russian, American, and even Japanese and Chinese exhibitors have already promised to take part in it. The Crown Prince of Germany has undertaken the protectorate of the exhibition and takes a great interest in its success.

Herr C. Reclam has recently made a detailed report of the first cremation which took place at Gotha a short time ago. He calculates the cost of each cremation at about 4*l.*, which in case the furnace is in continual use, so that between two processes it has not time to cool, would be reduced to 3*l.* It is hoped in Germany that the example of Gotha will soon be followed by other cities so that Milan and Gotha will no longer be the only cities where cremation takes place.

Prof. Asa Gray, we learn from *Harper's Weekly*, announces the detection, after the lapse of a hundred years, of a plant obtained by Michaux in the mountains of North Carolina, and known as the *Shortia galacifolia*, the re-discovery also having occurred in M'Dowell County, in North Carolina, in a region east of the Black Mountains.

Science News for December 15 contains some "Later Notes on Texan Birds," by George B. Sennett, the result of a second journey to south-western Texas made last spring. The Notes chiefly refer to nesting habits of the more peculiar forms. The region was on the banks of the Rio Grande within a few miles of its mouth, with Lomila Ranche as the central point.

"Vögelbilder aus fernen Zonen" is the title of an atlas of foreign birds just published by Fischer, of Cassel, under the care of Dr. Ant. Reichenow. The first part, before us, contains three beautifully coloured plates of birds, artistically grouped amid suitable surroundings, each plate having explanatory text, in which each species represented is pretty fully described, giving not only the scientific but also the native, German, French, English, and other names of the birds. The three plates are devoted to parrakeets and allied kinds. The same publisher sends us a series of large zoological wall-plates, admirably adapted, it seems to us, to teaching zoology in a thoroughly scientific manner. The plates sent us are mainly devoted to the lower forms, the specimens selected being enormously magnified, coloured, and exhibiting all details both of external and internal structure.

"The Year Book of Facts in Science and the Arts," edited by James Mason (Ward, Lock, and Co.), is little better than a scrap-book of cuttings from various papers; we don't suppose it is seriously intended to represent the science of the past year.

Messrs. Hardwicke and Bogue have issued a second edition, "revised and corrected," of Mr. M. P. Edgeworth's work on "Pollen," noticed in our columns on its first publication (Nature, vol. xvi. p. 499).

At the last meeting, December 6, of the Russian Geographical Society, Col. Rykatchoff made a communication on the difficulty of organising observations on rain and storms.—Prof. Meller made a very interesting communication on the former connection between the Sea of Azov and the Caspian. The character of the geological formations on the tract between both seas proves without doubt that during the tertiary epoch the waters of both were connected; thus organic remains of Caspian origin are found within eighty-seven miles from the actual shores of the Sea of Azov.

At the last meeting of the St. Petersburg Physical and Chemical Society, Prof. Beketoff made a communication on the atomic heat-capacity of hydrogen when mixed with palladium. He determined it as equal to 5·86, *i.e.*, very near to that of copper and silver.

Those of our readers who are in the habit of using chemical apparatus should get the Revised List just issued by Mr. Fletcher, of Warrington, who deserves credit for the very successful efforts he makes to introduce improvements into this department.

The much-talked-of canal between Delaware and Chesapeake Bays, which will shorten the water-route from Baltimore to New York and Europe by 225 miles, is now at last to be constructed. Its length will be seventeen miles, and the cost is estimated at four million dollars. It will run through the Sassafras Valley and will have no locks.

The additions to the Zoological Society's Gardens during the past week include a Punjaub Wild Sheep (*Ovis clycloceros*) from India, presented by Col. W. R. Alexander; two Californian Quails (*Callipepla californica*) from California, presented by Mr. William Turquand; seven Brown Tritons (*Geotriton fuscus*), South European, presented by Prof. H. H. Giglioli, C.M.Z.S.; a Feline Dowrocouli (*Nyctipithecus felinus*) from South America, purchased.

FURTHER RESEARCHES ON THE SCINTILLATION OF STARS

Since last we reviewed M. Montigny's valuable researches on the scintillation of stars (vol. xviii. p. 292) he has again published some highly interesting details. The researches now in question refer specially to the changes of colour which characterise the scintillation of the *red* and *orange* stars. M. Montigny tried to solve the question whether the changes of colour in scintillation follow certain definite laws; whether, for instance, their relative frequency expressed in numbers, shows differences which depend on the nature of the star's own light, on the star's elevation above the horizon, or on the condition of the atmosphere.

In order to solve this complicated question, it was divided into its several parts. First of all M. Montigny investigated the influence of the star's own light and that of the condition of the atmosphere upon those colours which characterise the scintillation of the stars of the so-called third type. Our readers will remember that these are the stars which show black lines as well as dusky bands in their spectra; they are generally of a red or orange colour, and mostly variable. There are not many fine stars in this class, the most remarkable ones are about thirty in number, and M. Montigny has examined only the following fifteen:—β Andromedæ, α Ceti, ρ Persei, Aldebaran, Betelgeuze, α Hydræ, Arcturus, δ Virginis, δ Coronæ, α Serpentis, Antares, α Herculis, γ Aquilæ, and β and ε Pegasi. The evenings of observation now number 476, and reach from October, 1870, to February, 1878.

The way in which the observations were made was the following:—After each evening of observation not only the values for the intensity of scintillation were entered for each star, reduced to a distance of 60° from the zenith, but each single colour observed in the circular image was also noted down. Further, the observations made in wet weather were noted separately from those made during dry weather. Finally the various colours were entered on a table divided into seven columns, respectively headed—red, orange, yellow, green, blue-green, blue, and violet. The sum total of any column thus indicates the number of times which the colour in question was observed in a certain star. Arcturus, for instance, in 131 observations during moist weather, showed the red colour 130 times and blue 118 times. These numbers thus express the absolute frequency of these two colours. If we compare the number 130 for red, with the sum total of all colours shown by Arcturus during rainy weather, which is 491, then we obtain the relative frequency of red, which is 0·265, or multiplied by 1000 = 265. Therefore in 1000 changes of colour which appeared in Arcturus during rainy weather, red occurred 265 times, and blue 240 times.

In the following table we give the average frequencies of the different colours for the fifteen stars of the third type enumerated above; line A shows the frequencies observed in rainy weather, and B those observed in dry weather. The total of observations was 800 for A and 368 for B; the totals of the changes of colour observed were 2,982 for A and 1,368 for B.

	Intensity.	Red.	Orange.	Yellow.	Green.	Blue-green.	Blue.	Violet
A ...	60	272	194	239	57	4	230	3
B ...	43	278	213	222	63	5	216	4
Average	52	275	204	230	60	5	223	4

We observe in this table that (1) the relative frequency of red is far greater than that of any other colour in rainy weather as well as in dry; (2) red, green, and particularly orange are seen more frequently in dry weather than in wet; (3) the frequency of yellow and blue is on the contrary greater in wet weather than in dry.

Although the differences in the frequency of one and the same colour, according to the state of the atmosphere, are rather limited, they nevertheless indicate an important fact. It is also remarkable that the numeric differences in the complementary colours red and green on the one hand, and blue and yellow on the other, lie in the same direction. It is further worthy of notice that the greater frequency of blue in rainy weather agrees well with the fact that blue greatly predominates during such weather in the image of the star as shown by the scintillometer. This predominance of blue has also been frequently observed a short time previous to rainy weather.

The following table will be found interesting, as it contains the changes of colour and intensity of scintillation of the six brightest stars of the third type. In line I. are those of Betelgeuze, which is orange coloured, and the spectrum of which shows numerous broad bands, dissolvable into lines; line II. gives those of Aldebaran, pale red, whose changing spectrum has many well-defined lines and dark bands; line III. represents Arcturus, yellow-orange, with numerous dark lines not united into bands in its spectrum; line IV. gives those of α Hydræ, a yellow star with very dark lines in the spectrum; line V. those of Antares, red, with wide bands and very distinct lines; and line VI. those of α Herculis, yellowish red, with black lines and dark bands.

	Intensity.	Red.	Orange.	Yellow.	Green.	Blue.	Violet.
I. Betelgeuze ..	65	255	190	234	106	202	13
II. Aldebaran ...	62	255	186	232	104	210	13
III. Arcturus ...	61	253	120	246	130	219	32
IV. α Hydræ ...	55	284	162	253	113	188	—
V. Antares ...	53	266	121	245	130	219	33
VI. α Herculis ...	47	275	225	232	51	217	—
Average	57	265	167	240	106	209	15

These values show that the relative frequencies of the three principal colours, red, orange, and blue, remain within narrow limits for the six stars. Yet red seems to increase in frequency in the three last stars, two of which are of a decided red tint,